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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Nicholas Charles PARSON et al.

Serial No. : 10/066,442

Group Art Unit 1742

Filed : February 1, 2002

Examiner S. Ip

For : ALUMINIUM ALLOY AND EXTRUSION

DECLARATION OF NICHOLAS CHARLES PARSON UNDER 37 C.F.R. §1.132

I, Nicholas Charles PARSON, declare that:

1. I am a British subject now residing at 1659 Grousewood Lane, Kingston, Ontario, Canada K7L 5H6, and am a joint inventor of the invention described and claimed in the above-identified application. I am and all times material hereto have been employed by Alcan International Limited (Alcan), assignee of this application and its parent, application No. 09/142,301 (now U.S. patent No. 6,375,767), of which the present application is a continuation.

2. I am the same person who executed a Declaration under 37 C.F.R. § 1.132 on June 14, 2000, in the aforesaid application No. 09/142,301. A copy of my Declaration executed June 14, 2000, is attached hereto as EXHIBIT 1 and is incorporated herein by this reference.

3. On page 6 of EXHIBIT 1, information concerning commercial success of the invention in 1998 and 1999 is set forth. Since then, the commercial success has continued. Production of the product of the claimed method by the assignee's affiliates reached

a total of 16220 tonnes (MT) in 2003 and 22387 tonnes (MT) in 2004, a greater than twenty-fold increase over the 1998/1999 shipments. However, the premium mentioned at page 6 of EXHIBIT 1 is no longer charged.

4. The use of the claimed method permits the producer of the product to fill a customer order for billet with material having uniformly controlled low copper levels in all billets within consecutive lots. This means that the customer has greater certainty that all extrusions produced from a billet shipment will anodize to the same high quality level as previous and subsequent lots and therefore reduces possible scrapped extrusions. The low copper also reduces the amount of metal removed during anodizing, creating less waste to treat.

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5. ^{Approximately} 20% of aluminum extrusions are given an anodizing treatment to give a durable decorative coating. In its simplest form the process consists of 2 steps:

(1) etching - usually in a sodium hydroxide solution to attack the aluminum surface giving an enhanced surface topography at a microscopic level that increases light scattering which reduces brightness or glossiness.

(2) anodizing - a coating of aluminum oxide is grown electrochemically in a sulphuric acid solution by converting the aluminum to its oxide. In this process the surface topography of the original surface is maintained. The depth of the "anodic layer" can be from 2 microns to about 25 microns. The aluminum oxide has a high degree of transparency to light such that the underlying etched surface topography is still visible and its light scattering effect is still operative.

6. The anodic layer consists of parallel hollow tubes of aluminum oxide that grow perpendicular to the metal surface. This type of finish is referred to as clear anodized. In many cases a secondary treatment is applied wherein the pores are filled with another metal such as nickel or tin electrochemically to give a color such as black or bronze. For high quality applications such as commercial door and window, fascia on high rise buildings, architectural projects, machine parts, "Hi-Fi" panels and automotive trim, a uniform matte finish is considered more pleasing to the eye and is desirable for both clear and colored finishes. The underlying metal surface produced in the etch step is primarily responsible for this aspect of the product.

7. The inventive alloy, and the controlled level of copper impurity, ensures that the etched surface has an optimized "topography" giving maximum scattering of incident light to give a so-called "matte or low gloss" finish desirable to the end user. This aspect of the product is not simply subjective but can be measured by a reflectivity or gloss meter, many models of which are commercially available. Of particular concern to the customer is the batch to batch consistency of the finish. For example, many large architectural projects utilize large quantities of extrusions that are inevitably produced from multiple cast lots and extruded lots. When all the product is visible to the naked eye the consistency of the finish is critical and the invention minimizes such variations. Even when various batches are not present side by side in the end application, many end users still require consistent part to part quality over time, for example in the automotive sector.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and

belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

N.C. Parson

NICHOLAS CHARLES PARSON

Date: OCT 21st 2005



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Nicholas Charles PARSON et al.
Serial No : 09/142,301 / Group Art Unit 1742
Filed : September, 4 1998 Examiner: S. Ip
For : ALUMINIUM ALLOY AND EXTRUSION

DECLARATION MADE UNDER 37 C.F.R. §1.132

I, NICHOLAS CHARLES PARSON, declare that:

I am a British subject, residing at 102 Oxford Road, Banbury, Oxfordshire, OX16 9AW, Great Britain.

I am an inventor of the present application. I have a bachelors degree in Metallurgy and a PhD in Mechanical Metallurgy. From December 1984 to present day I have been employed by Alcan International Limited (Alcan), the applicant/assignee in this case. From about 1988 I was project leader in a major research effort to provide improved aluminium extrusion billet chemistries and microstructures for specific end uses in the extrusion industry.

In this Declaration I provide a summary of the Alcan development work i.e.: aluminium alloy and extrusion developments for low matt anodising.

The alloy of this invention is produced in a smelter where virgin aluminium oxide is reduced to the metal in an electrolytic cell. This metal is fairly pure typically containing 99.5 or 99.7% aluminium. Only a small amount of metal is sold in this pure unalloyed state. Most of the metal is taken from the cell and, while still liquid, transferred to a casting centre where alloying additions including Mg and Si are made before the metal is cast to extrusion billet.

A large number of aluminium alloys are made in the casting centre. Some will be relatively pure such as AA1050A whilst others will be relatively highly alloyed with magnesium, silicon, iron and copper amongst other elements. During the casting process and subsequent treatments, a certain amount of solid scrap metal is generated. This metal is recycled by adding it to the virgin

metal at the casting centre. This recycled scrap introduces a number of alloying elements into the relatively pure liquid metal. Some of these elements are desirable additions. In AA6000 series alloys, the scrap adds Mg, Si and Fe to the melt which are necessary alloying additions. However, the scrap may also introduce elements such as Cu that are undesirable additions.

Another source of copper contamination can occur when the type of alloy being cast is changed over from say an alloy containing a deliberate copper addition such as AA6463 or AA6061. Any metal remaining in the batching furnace can contaminate subsequent batches and care has to be taken to flush the furnace or plan a number of casts with copper free alloys prior to producing the alloy for matt anodising covered by the current invention.

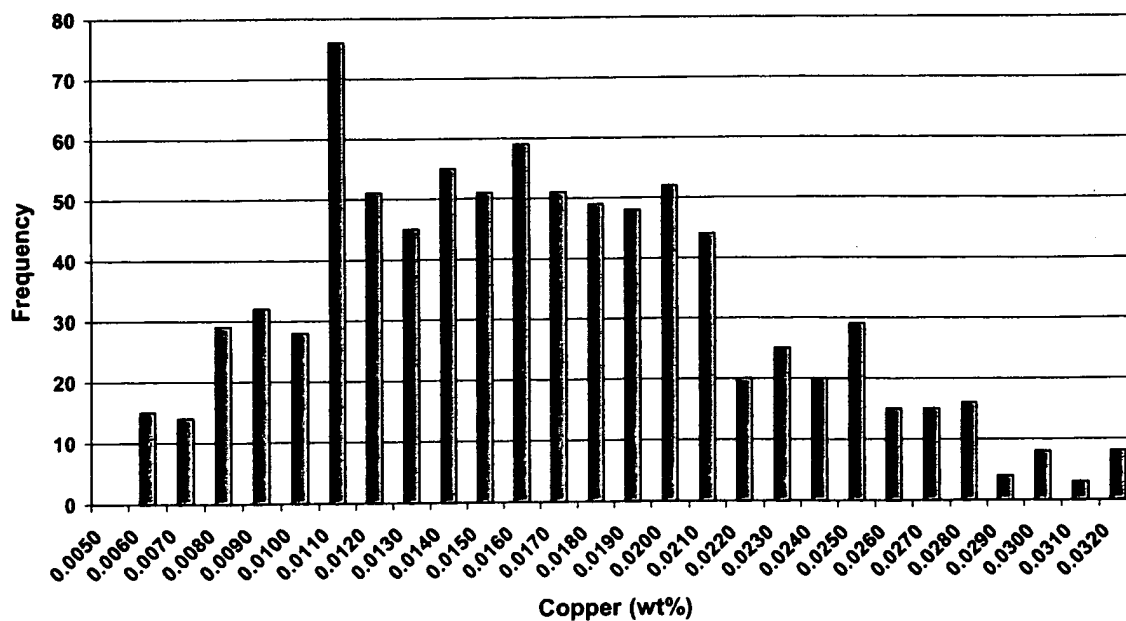
Since aluminium alloys cannot be purified by any practical commercial process, any alloying element present in a cast of metal at too high a level cannot be removed. The only practical way to reduce the proportion of the alloying constituent is by dilution with purer metal. For this reason, extreme care has to be taken to prevent contamination of the cast with casthouse scrap that contributes unacceptably high levels of unwanted alloying elements. For example, where the extrusion billet is to be used for the production of billets for anodising, the Zn level must be below 0.03wt% Zn. This is achieved by avoiding the addition of Zn from Zn containing scrap or from other sources.

Before the present invention, no such attempt was made to control the Cu level in this class of alloy provided that it remained below 0.10wt%, that is the level set by the AA specification for AA6060 and AA6063. At this level it can raise extrusion pressure which can be detrimental to extrusion productivity and normally a working upper limit for copper would be ~0.03-0.05wt% in a smelter casting centre. In remelt operations, where a large percentage of externally sourced extrusion scrap is charged to the melting furnace such control is often not possible, such that the copper level can often be close to the AA limit. The actual level of Cu in such alloys produced in a smelter depended on the Cu content of the in-house casting scrap used and the

amount of Cu in the virgin smelter metal. Extrusions made from such metal showed an unexplained variation in mattiness from batch to batch after etching and anodising.

The variation in Cu levels shown in Fig 1 below is for casts of the alloy of the same composition limits as the present invention, but without the benefits of the control of the Cu content now realised to be essential. These 116 separate casts were produced between September 1998 and July 1999. In the production of these casts, the scrap content has been controlled with the aim of achieving the correct Si and Mg and Fe and Zn levels but with no regard for Cu other than keeping it below 0.10% as required by the AA specification. Internal limits set by the smelter may be lower than the 0.10% required to meet the AA specification and may be as low as 0.03%. This was the normal situation before the present invention.

**Figure 1. Histogram of Copper Content in Uncontrolled Casts
(Alloy 65054)**



The present invention arose from the realisation that such undesirable variation in matteness could be avoided by controlling the Cu level below 0.015%, preferably below 0.010%, in *all* of the metal from cast to cast with the low Cu level. To achieve this requires a previously unrecognised level of control over the use of recycled scrap, furnace flushing and planning of alloy changes. It also imposes extra restrictions on the production process which had not previously been considered due to increased production costs and the difficulties of running the casting centre which results in a higher rejection rate from billets not meeting the tight composition limits.

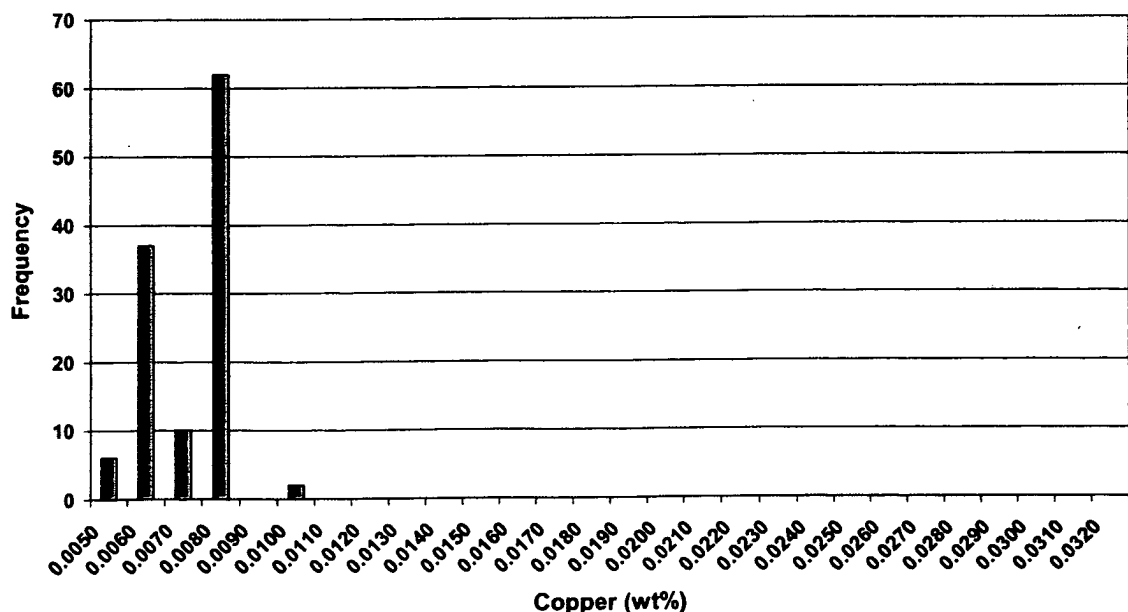
In order to provide the improved billets of this invention, very careful control of the type and amount of scrap is required because these low limits on Cu can be exceeded by the addition of surprisingly small amounts of scrap from the common AA6000 series alloys. A normal cast of metal in the casting centre would be around 40 tonnes. This would be made up of up to 10% scrap added to the virgin liquid metal from the electrolytic cell. The scrap is selected from alloys that are as close as possible to the composition of the metal to be produced. Alloys of the present invention could include scrap from other AA6000 alloys such as AA6061 (nominally 0.15-0.40% Cu), AA6463 (max 0.2% Cu,) 6005A (maximum of 0.30% Cu). The average Cu content of the scrap could be around 0.2%.

The virgin metal can contain up to 0.0050 wt% Cu arising from the impurities in the alumina from which the Aluminium is extracted and from impurities in the materials from which the electrodes and the cell walls are constructed or from the copper studs used to hold the electrodes. A typical figure is ~0.0035wt% Cu. The actual level of Cu in the virgin metal varies according to the source of the alumina and the materials used in the construction of the cells.

To keep the Cu content of the billets below 0.015%, of the four tonnes of scrap added to the furnace, only about 2.3 tonnes can have 0.20% Cu and the remaining 1.7 tonnes must have a Cu content at least as low as that of the virgin metal. To achieve a Cu level below 0.010% only 1.3 tonnes of such scrap can be added and 2.7 tonnes of virgin metal.

It can therefore be seen that Cu will inevitably be present in the billets not only from recycled scrap but also from the virgin metal and previous alloy types produced in the furnace. Unless steps are taken to control the composition of the metal produced, it is inevitable that Cu content of some members of a series of casts produced in the casting centre will contain more Cu than is acceptable in improved billets of the present invention. With adequate control of the scrap addition and with attention to the Cu content of the virgin metal and planning of alloy changes and furnace flushing, it is possible to control the Cu in the billets to provide the billets of the present invention. The variation in the Cu content of a population of billets produced according to the present invention at the same smelter and for the same time period as the uncontrolled casts is shown in Fig 2 below.

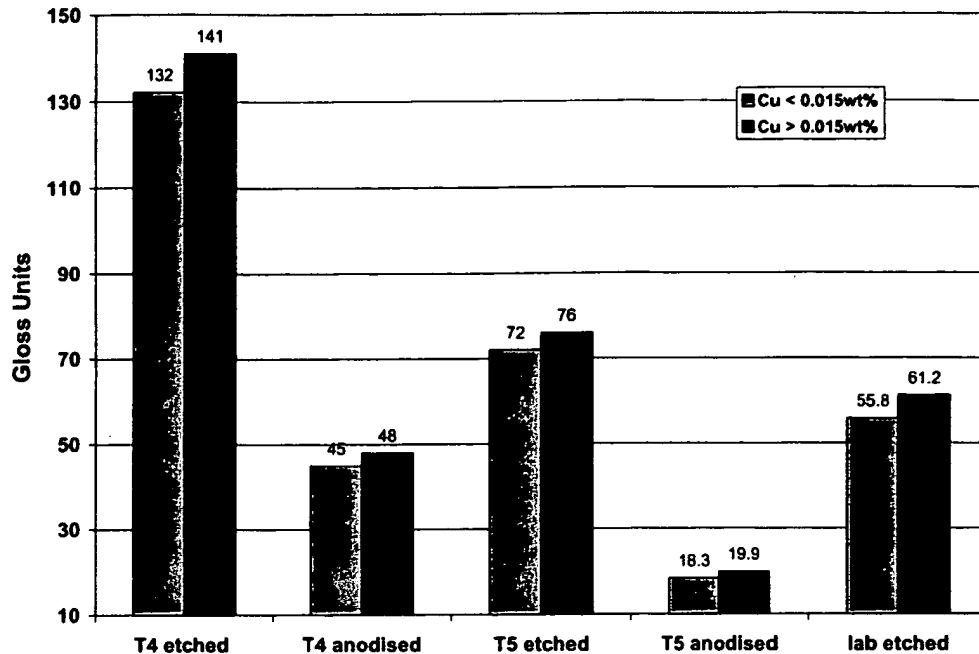
**Figure 2. Histogram of Copper Content in Controlled Casts
(Alloy 64059)**



The alloy was produced and subsequently tested at a customer's plant. The inventive alloy with the controlled copper content was extruded alongside an alloy with a copper content greater than 0.015wt%. The extrusions were etched and anodised in the T4 and T5 tempers and the gloss was measured before and after anodising. Figure 3 summarises the results, where in all

cases the alloy with the controlled copper content gave a better finish both by eye and by gloss measurements.

Figure 3 Results of Production Trials of Matt Alloy



The invention has been commercially successful in the very short time since the alloy was introduced. In 1998, the first full year of production, 1102 MT were sold having a value of about US\$1.9 million. In 1999 the figure was 887 MT having a value of \$1.55 million. Sales are expected to rise substantially in 2000.

To control sale to a level compatible with the smelter production it is anticipated it will soon be necessary to increase the price over the standard alloy to a premium of 0.3 US cents/lb. representing an increase in revenue of ~US\$6 /tonne on an expected volume of 5000 tonnes.

I hereby declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by

fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

N. C. Parson

NICHOLAS CHARLES PARSON

June 14th 2000

Date